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ABSTRACT

Developed by the ABCs of Construction National Workplace Literacy Project, these curriculum materials for the occupational area of millwright contain a lesson that deals with reading diagrams. The lesson consists of an objective, instruction, and 10 exercises. Three types of problems are provided in each exercise: "try it," "apply it," and "go with it." The objective for the lesson is for the student to learn to locate and apply information from a diagram. (YLB)

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ED 374 298

TECHNICAL DEVELOPMENT CENTER

Reading Diagrams

Millwright

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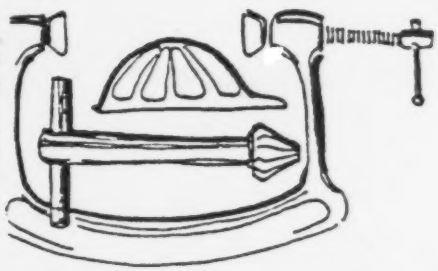


Associated Builders & Contractors, Inc.
EBR Adult & Continuing Education

ABC's of Construction
National Demonstration Project in Workforce Literacy

The ABC's of Construction Project was funded in 1991 by the U.S. Department of Education as a grantee through the National Workplace Literacy Program (PR #198A10155). The program provided basic skills instruction to industrial construction workers employed by companies which are members of the Pelican Chapter of Associated Builders and Contractors (ABC). Located in Baton Rouge, Louisiana, ABC provides training to employees of over 60 member companies who perform contract work in the 58 petrochemical facilities located along the Mississippi River between Baton Rouge and New Orleans.

The grantee, the Adult Education Department of East Baton Rouge School Board, performed a comprehensive literacy task analysis of the apprenticeship training program for millwrights, pipefitters, electricians, instrumentation techs, and welders involved in the ABC training program. Over 20 modules of original, contextual curriculum were developed to teach the reading and math skills required for success in the craft training program.

Materials developed for instruction incorporated cognitive strategies for learning basic skills in the context of the craft and safety knowledge demanded by the industrial construction workplace. Instruction was written for a competency-based, open-entry/open-exit, individualized adult learning program that operated at the ABC training center in the evenings after work-hours.

READING DIAGRAMS

MILLWRIGHTS

OBJECTIVE: You will learn to locate and apply information from a diagram.

INSTRUCTION:

Knowing basic layout is part of being a millwright. Layout lets you show sizes and shapes of specific areas. You use basic layout tools to measure and lay out different parts and areas. When you lay out parts, you make flat pictures of three dimensional items. These pictures might also be called diagrams. Layouts are one kind of diagram. There are many others. Instead of making your own diagrams, most are already made for you.

Diagrams have many uses. They often show complex concepts. They can also show simple details. Diagrams can show a reduced version of something large. They can show an enlarged version of something very small. They help you picture processes, structures, relationships, or details. In all cases, diagrams help you visualize. You use diagrams on the job. You also find diagrams in millwright coursework.

All diagrams have a main idea or purpose. The diagram's title helps you determine main idea. Diagrams also have details. Labels show you which details require your attention. Your job is to decide how the details relate to each other and to the main idea.

Text descriptions often accompany diagrams. These serve varied functions. It can identify the main idea. It can list details. Text descriptions can also tell you things you might not be able to see from the picture. It can tell you how something works. It can explain specific features. It can describe processes and relationships. Looking at the description as you look at the diagram increases understanding. You may find diagrams hard to understand after one reading. That's OK. Use both the diagram and the text as references until you understand them.

STEPS IN READING DIAGRAMS

1. **READ THE TITLE.** The title tells you which process, relationship, or item is shown.

2. **EXAMINE ANY LABELS.** Labels focus on important features.

3. **WHAT IS THE PURPOSE OF THE DIAGRAM?** Why does this item or process needed to be pictured?

4. **WHAT TEXT INFORMATION ACCOMPANIES THE DIAGRAM?** What describes the diagram? How is it described? What details are included? Why are those details included? How do the text and the diagram go together?

5. **WHAT IS THE MAIN IDEA?** How can you describe the diagram? What's important about it? How does knowing this apply to your work?

EXAMPLE

SCREWDRIVER USE

When using screwdrivers, remember the following important rules:

1. Select the proper type of blade for the screw head
2. Make sure the screwdriver size fits the screw correctly as shown in Figure 1-5.
3. Always point the screwdriver blade away from you when working close to your body. If the blade were to slip, you could be injured with the screwdriver blade.

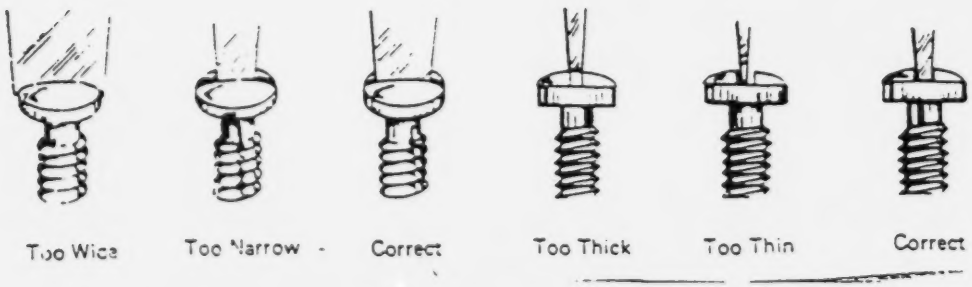


Figure 1-5. Fitting the Screwdriver Blade to the Screw Head

1. **READ THE TITLE.** The title is "Fitting the Screwdriver to the Screw Head."

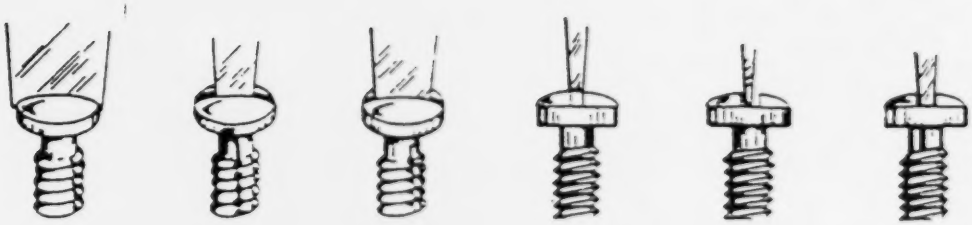
2. **EXAMINE ANY LABELS.** The following labels are shown: "Too Wide," "Too Narrow," "Correct," "Too Thick," "Too Thin," "Correct."

3. **WHAT IS THE PURPOSE OF THE DIAGRAM?** The purpose is to show correct and incorrect screwdriver usage.

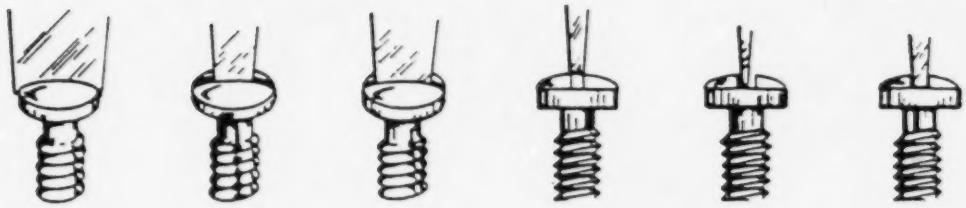
4. **WHAT TEXT INFORMATION ACCOMPANIES THE DIAGRAM?** The text describes three rules for screwdriver use. The second rule--screwdriver fit--refers to the diagram.

5. **WHAT IS THE MAIN IDEA?** The main idea is that there are right and wrong ways to use a screwdriver.

While diagrams have a purpose, your reason for using them can vary. For example, you might use the preceding diagram to focus on the correct usage only. The following diagram shows you the parts you might use for that purpose.

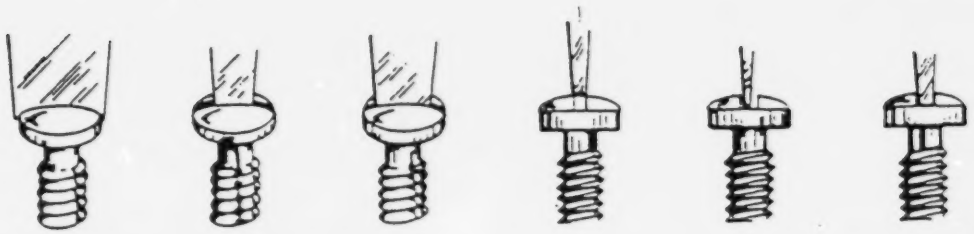


Or, you might have experienced some problems with screwdriver usage. The diagram could help you pinpoint your mistakes.



Too Wide Too Narrow Correct Too Thick Too Thin Correct

Finally, you might wish to compare good and poor technique in screwdriver use.



EXERCISE 1

Jules is rebuilding a power plant generator. The new parts must fit exactly. Jules uses a micrometer to make measurements. He reads the following to review:

READING THE MICROMETER

When the micrometer is correctly adjusted to fit the work to be measured, read the measurement shown on the sleeve and thimble markings.

Each complete turn of the thimble moves the spindle 1/40 or 0.025 inch. The line that runs lengthwise on the sleeve is divided into 40 equal parts. Each short vertical mark on this line represents 1/40 or 0.025 inch. Every fourth mark is longer and represents 0.100 inch.

The beveled edge of the thimble is divided into 25 equal parts. Each of these parts represents 1/1000 or 0.001 inch. Sometimes each of these lines is numbered, and sometimes every fifth line only is numbered.

To read the measurement shown on the micrometer, find the highest number visible on the sleeve. To this number, add the number of vertical lines shown between the number and the thimble edge. Because each line equals 0.025 inch, 2 lines = 0.050, 3 lines = 0.075, etc. Then, to this total, add the number of divisions on the bevel of the thimble from zero to the line even with the horizontal sleeve line. For example, Figure 2-17 shows a micrometer reading of 0.178 inch.

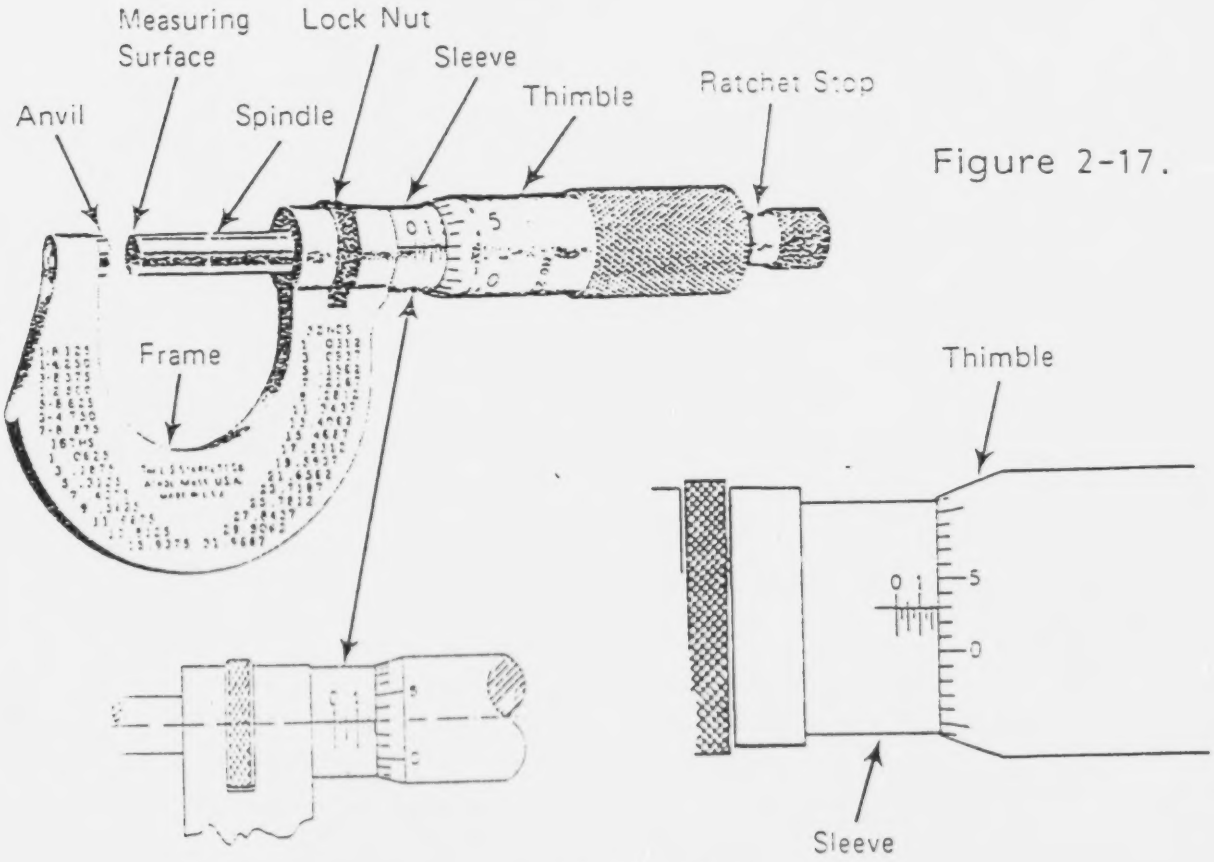


Figure 2-17.

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The reading of 0.178 inch is composed of:

1 large (numbered) graduation or 1 x 0.100 = 0.100
PLUS

3 small graduations between the numbered mark and the thimble edge or 3 x 0.025 = 0.075
PLUS

3 graduations on the thimble or 3 x 0.001 = 0.003

TOTAL 0.178 inch

To help remember how to read a micrometer, count the divisions on the sleeve as if they were quarters and the divisions on the thimble as if they were pennies. Add the total and place a decimal point where the dollar sign should be.

Another way to read the micrometer is to count each of the graduations on the sleeve and multiply by 0.025 inch. Then add the number of divisions on the beveled edge of the sleeve from zero to the line even with the horizontal line on the sleeve.

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

4. This diagram has three separate drawings. What is the relationship among them?

_____

_____

_____

5. What seems to be the purpose of the diagram?

_____

6. Does text accompany the diagram? _____

What is the relationship between the text and the diagram?

_____

_____

7. Where might you find the item shown in the diagram?

_____

_____

APPLY IT!

1. Jules looks at his micrometer. He finds a kind of chart on the frame. What fraction of an inch is equal to .375?

A. 1/4

B. 3/8

C. 1/3

D. 3/4

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. What is the decimal equivalent for 7/16 inch?

A. .1875

B. .6875

C. .875

D. .4375

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. What is the decimal equivalent for 7/32 inch?

A. .2188

B. .7188

C. .7812

D. .4375

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. Which has the largest decimal equivalent--5/8 inch, 5/16 inch, or 5/32 inch?

A. 5/8

B. 5/16

C. 5/32

D. They are equivalent

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. Jules turned the thimble once. How much did the spindle move?

A. 1/40 inch

B. .025 inch

C. Neither A nor B are correct.

D. Both a and B are correct.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

6. Each short vertical mark on the sleeve equals_____.

A. 1/40 inch

B. .025 inch

C. Neither A nor B.

D. Either A or B.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

7. Each mark on the beveled edge of the thimble equals _____.

A. 1/25 inch

B. 1/1000 inch

C. 1/40 inch

D. .025 inch

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

8. Jules checks the micrometer. It is set as follows:

The highest number visible on the sleeve is 2.

Two vertical lines are between the number and the thimble edge.

Three division are on the bevel at the point even with the horizontal sleeve line.

The micrometer is set at _____.

A. .223 inch

B. .275 inch

C. .253 inch

D. .233 inch

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

9. Jules must set the micrometer for .195 inch. What should be the micrometer setting?

A. 1 large graduation, 3 small graduations, 20 graduations on the thimble.

B. 2 large graduation, 2 small graduations, 15 graduations on the thimble.

C. 1 large graduation, 2 small graduations, 25 graduations on the thimble.

D. 2 large graduation, 1 small graduations, 5 graduations on the thimble.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

10. Jules must measure the generator shaft. What two surfaces will touch the shaft?

A. thimble and sleeve
B. spindle and measuring surface
C. locknut and frame
D. anvil and measuring surface

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

A new worker joined your crew. You have a micrometer, but not the accompanying text. Describe how to set the micrometer for 0.160 inch.

EXERCISE 2

J.W. must install a new compressor. J.W. usually uses a chain fall to lift such loads. This time he must use block and tackle reeving. He is less familiar with its operation. He refers to the following:

BLOCK AND TACKLE REEVING

Reeving means feeding the lines into blocks in the correct manner. If the blocks have equal numbers of sheaves (pulleys), then the dead end of the line (standing part) should be fastened to the becket of the fixed block. If the blocks have unequal numbers of sheaves, the rope should be fastened to the becket of the block having the least number of sheaves.

When reeving a pair of tackle blocks, one of which has more than two sheaves, the hauling part (lead line) should lead from one of the center sheaves of the upper block. This puts the lifting strain on the center of the block and keeps it from twisting and damaging the rope. Figure 1-2 shows how a two-sheave block and a three-sheave block are reeved. This system has a five-part fall.

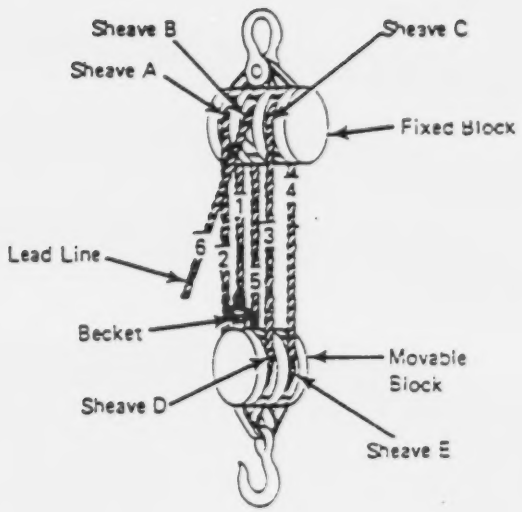


Figure 1-2. Reeving a Two- and Three-sheave Block

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

4. What is a sheave?

_____

5. What seems to be the purpose of the diagram?

_____

6. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

7. Where might you find the item shown in the diagram?

_____

APPLY IT!

1. J.W. plans to use two sheaves per block. He should fasten the standing part to _____.

A. the dead end of the line.

B. the fixed block.

C. the movable block.

D. the lead line.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. The top block is aligned on a North/South direction. How should J.W. align the lower block?

A. North/South

B. even with the top block

C. East/West

D. on a 45o angle to the upper block

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. J.W. is feeding lines into the blocks in a five-part fall system similar to that in Figure 1-2. What sheave should the lead line be fed through?

A. A
B. B
C. C
D. D

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. According to the diagram, lines 3-4 go around sheave_____.

A. A

B. B

C. C

D. D

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. According to the diagram, lines 2-3 go around sheave _____.

A. A

B. B

C. C

D. D

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Sometimes people read diagrams and draw incorrect conclusions. Which of the following conclusions is incorrect? Correct the ones which are incorrect.

1. The diagram shows 6 sheaves.

_____Correct _____Incorrect

Correction: _____

2. A sheaving is the same as reeving.

_____Correct _____Incorrect

Correction: _____

3. If a block has more than 2 sheaves. the lead line should start at the right of the block.

_____Correct _____Incorrect

Correction: _____

EXERCISE 3

Caleb is making a shaft for a conveyer belt. He uses a lathe center to support the work.

LATHE CENTERS are used to support work between the headstock and the tailstock. The center mounted in the headstock spindle is called the live center because it rotates with the workpiece. The center mounted in the tailstock spindle is called the dead center because it does not usually rotate. Tailstock centers make with antifriction bearings are called live centers. These centers permit heavier machining operations at higher rpms. All centers have a 60-degree included angle at the tapered point. This means the workpiece must have a 60-degree tapered hole drilled before it can be mounted between centers. Centers are used with a drive plate and lathe dog. Figure 4-28 shows a workpiece mounted between centers.

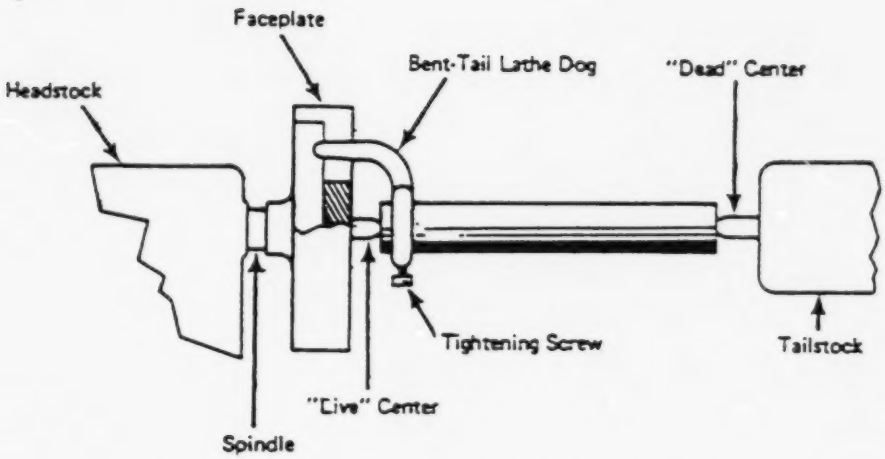


Figure 4-28. Work Mounted Between Centers

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

_____

4. What seems to be the purpose of the diagram?

_____

5. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

6. Where might you find the item shown in the diagram?

_____

APPLY IT!

1. Where is the "dead center?"

A. on the headstock

B. by the faceplate

C. on the tailstock

D. by the spindle

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. Where is the spindle?

A. between the live center and the faceplate

B. between the head stock and the faceplate

C. between the faceplate and the tightening screw

D. between the dead center and the tailstock

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. Where should Caleb mount the work?

A. between the live center and the dead center

B. on the faceplate

C. between the spindle and the live center

D. on the headstock

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. According to the accompanying paragraph, before Caleb mounts the work he must_____.

A. rotate the dead center 60 degrees.

B. attach a tapered point to the work.

C. check the antifriction bearings.

D. drill a 60 degree tapered hole in the workpiece for mounting purposes.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. What two parts are used with the centers?

A. dead center and live center

B. headstock and tailstock

C. drive plate and lathe dog

D. none of the above are correct

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Your coworker read the information about lathe centers. He does not understand some of the words. Explain the following:

rpm _____

_____

tapered _____

_____

live center _____

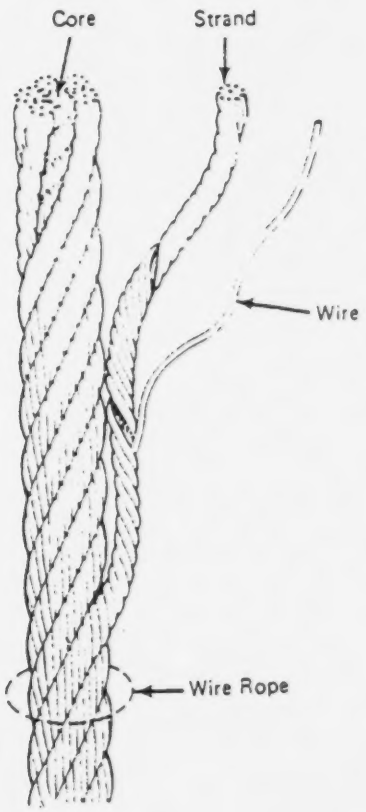
_____

dead center _____

_____

EXERCISE 4

Zoe is showing a new worker how to rig heavy loads with wire rope. She shows him a diagram of wire rope. She also explains the differences between core, strand, and wire using the following:



CORE The steel or fiber center of a wire rope. Supports the strands under normal bending and loading conditions. Also called the foundation of the rope. Different types of wire rope cores and their designations are: Fiber Core (FC), Independent Wire Rope Core (IWRC), and Strand Core (WSC).

STRAND Two or more wires twisted together.

WIRE Made of steel, iron, stainless steel, monel, or bronze.

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

4. What seems to be the purpose of the diagram?

_____

5. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

6. Where might you find the item shown in the diagram?

_____

APPLY IT!

1. The centermost part of wire rope is called _____.

A. wire

B. strand

C. core

D. none of the above are correct.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. What designation would be best for strand core?

A. WSC

B. RC

C. WCF

D. RCF

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. Which of the following would be considered a strand?

A. fiber core wire

B. IWRC

C. 6 wires twisted together

D. all of the above

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. The new worker reads about wire. Which of the following is not an appropriate substance for wire?

A. monel

B. stainless steel

C. bronze

D. tin

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. What are the three parts of a wire rope?

_____

_____

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Zoe explained the differences between core, strand, and wire.

What might she have said?

EXERCISE 5

Kyle works in heavy construction. He has been a millwright for five years. Now he has a new job. He must now read blueprints. He reads the following about reading section drawings:

SECTIONS

Section drawings are cutaway drawings that show the inside of an object or building. They are used to show the construction materials and how the parts of the object or building fit together. Next to the plan and elevation views, they are the most important drawings. The wall section shown in Figure 1-16 is an example of a sectional view.

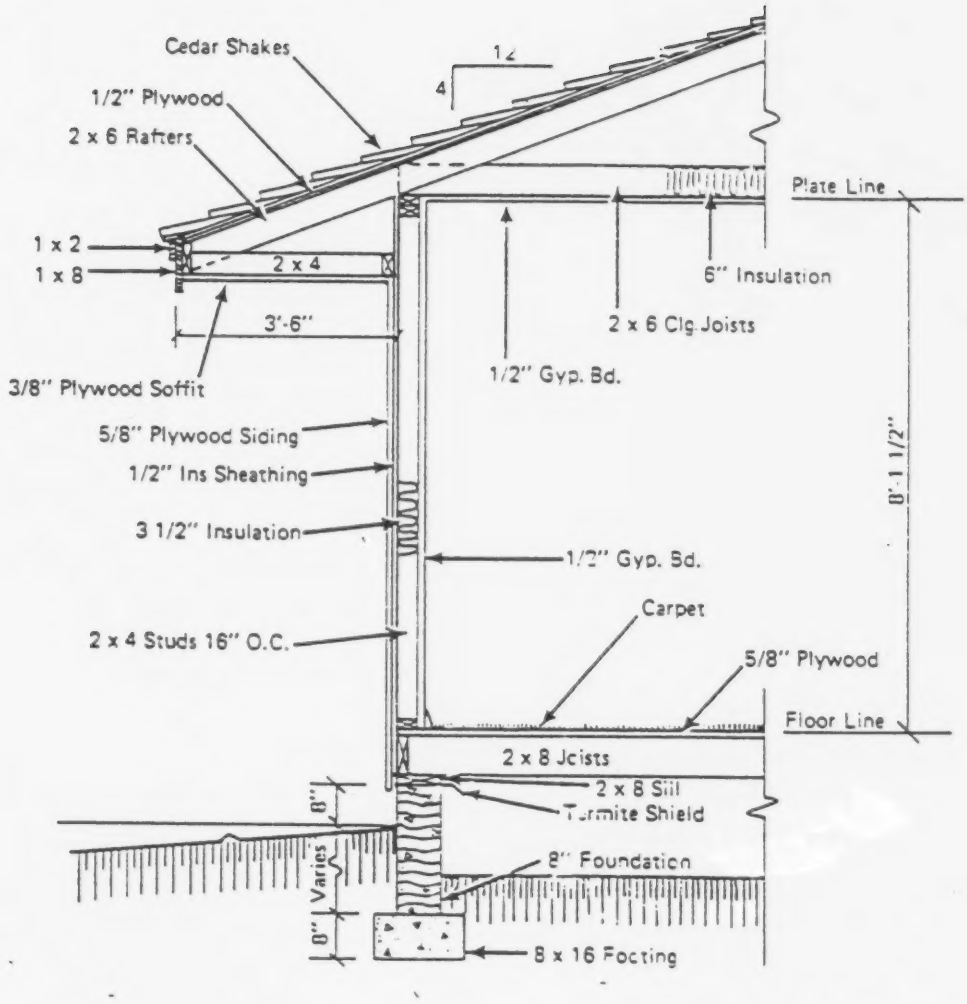


Figure 1-16. Sectional View (Wall Section)

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TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

_____

_____

_____

_____

_____

4. What seems to be the purpose of the diagram?

_____

5 Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

6 Where might you find a diagram like this?

_____

APPLY IT!

1. Where would Kyle find 1/2" gypsum board?

A. walls

B. ceiling

C. flooring

D. A and B

E. none of the above

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. What is the distance from the floor line to the plate line?

A. 3'6"

B. 8'1 1/2"

C. 6'

D. 12'

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. How much insulation is needed?

A. 8"

B. 10"

C. 6"

D. 12"

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. What material should be on the exterior walls?

A. 3/8 " plywood

B. cedar shakes

C. 3 1/2" insulation

D. 5/8 plywood siding

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. What material is used for the rafters?

A. 2 x 6

B. 2 x 4

C 1 x 2

D. 1 x 8

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Identify five facts you can derive from this diagram.

EXAMPLE: Plans call for 6 inches of insulation.

EXERCISE 6

Ralph is learning field sketching. He is learning to sketch angles. He uses the following information:

SKETCHING ANGLES

There are 360 degrees is a full circle. In sketching, you will normally use common angles such as 15, 30, 45, and 90 degrees. These common angles are shown in Figure 2-4.

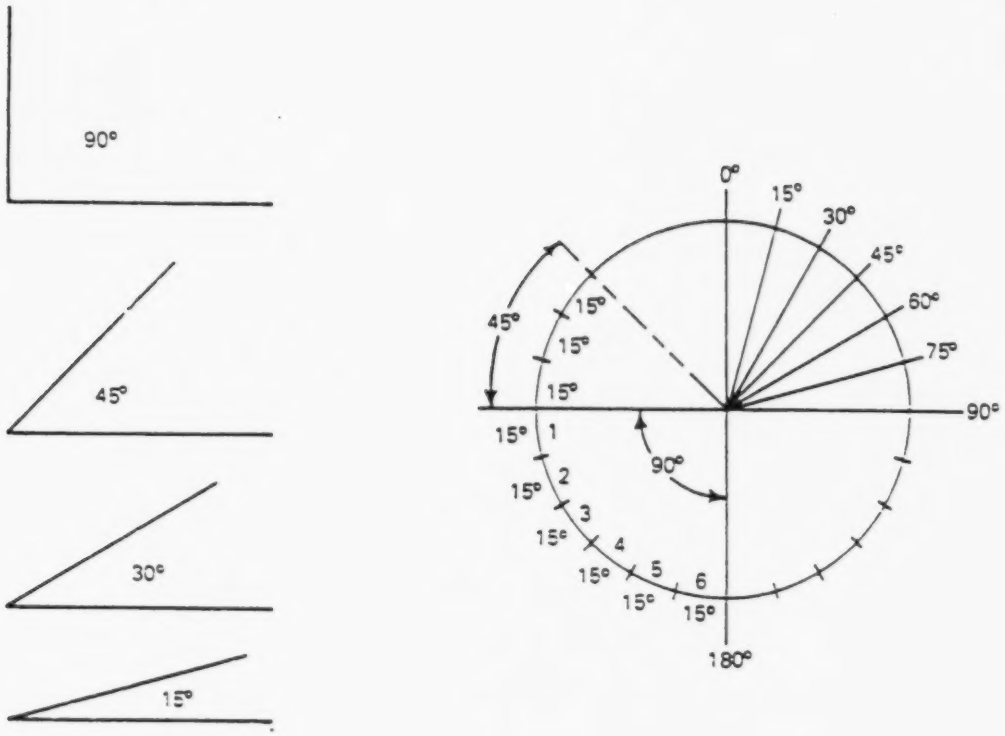


Figure 2-4. Common Angles Drawn in Field Sketching

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

4. What is the relationship of figures A, B, C, and D to the drawing on the right?

_____

_____

_____

5. What seems to be the purpose of the diagram?

_____

6. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

7. How might you apply the information found in this diagram?

_____

APPLY IT!

1. Ralph never realized that a straight line could be shown in degrees. How many degrees would that be?

A. 0 degrees

B. 90 degrees

C. 120 degrees

D. 180 degrees

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. Ralph is comparing angle sizes. Which of the following comparisons is true?

A. 90 degrees < 75 degrees

B. 45 degrees > 60 degrees

C. 15 degrees < 45 degrees

D. 45 degrees > 180 degrees

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. Ralph needs to draw a 75 degree angle. How many 15 degree angles equal 75 degrees?

A. 5

B. 4

C. 3

D. 6

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. Ralph wonders how many 30 degree angles are in a circle. How many is it?

A. 6

B. 9

C. 10

D. 12

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. Ralph decides to sketch his house. Which angle would be most appropriate for drawing the angles between walls and floors?

A. 120 degrees

B. 90 degrees

C. 75 degrees

D. 145 degrees

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Draw and label the following angles:

180 degrees

60 degrees

75 degrees

120 degrees

EXERCISE 7

Sean and Mike are new workers at a construction site. They will work with a crane. They will rig and move heavy equipment. Their supervisor gives them the following:

CRANE HAND SIGNALS

Most cranes make a lot of noise and they are usually operated in noisy construction areas. There are also times when the crane operator cannot see the load or the place he must put it. For these reasons, hand signals are used to direct the crane operator. There are a few basic hand signals that must be learned. You must be able to use these signals without mistakes.

The first signal, shown in Figure 1-51, tells the crane operator that you want the hook and wire cable to raise or lower the load. This signal means that the boom does not move.

The first signal, shown in Figure 1-51, tells the crane operator that you want the hook and wire cable to raise or lower the load. This signal means that the boom does not move.

Raise the Load

Lower the Load

Raise Load Slowly

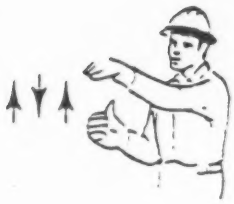
Lower Load Slowly

Figure 1-51. Raise or Lower Load Signals

The next signal you should learn directs the movement of the boom. Figure 1-52 shows this signal.

Raise the Boom

Lower the Boom

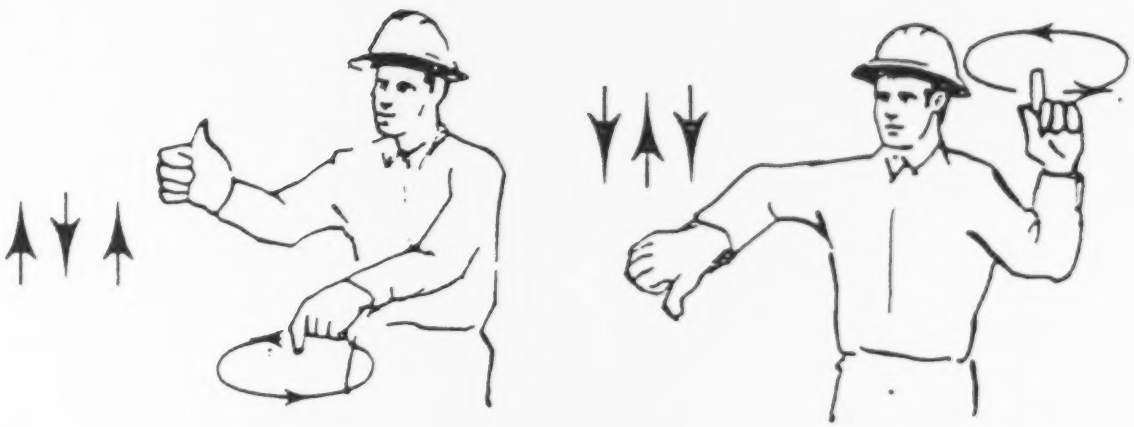


Raise Boom Slowly

Lower Boom Slowly

Figure 1-52. Raise or Lower Boom Signals

Sometimes the boom and load signals must be given together. Figure 1-53 shows how this is done.

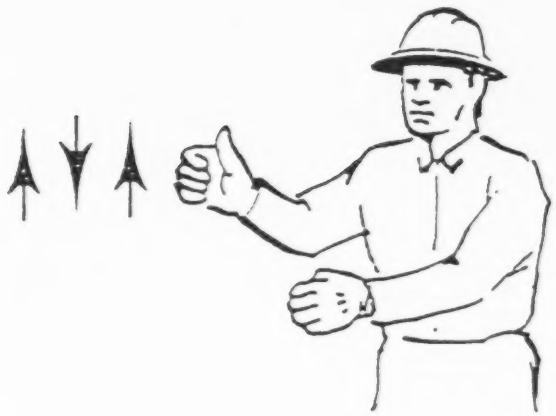


Raise the Boom and Lower the Load

Lower the Boom and Raise the Load

Figure 1-53. Combined Boom and Load Signals

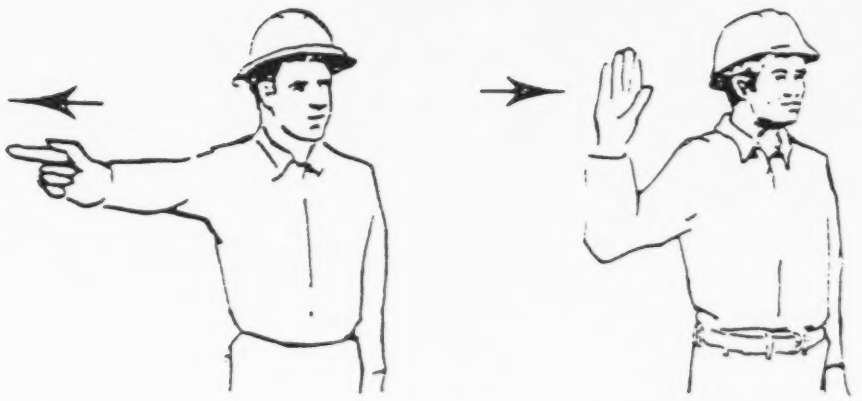
To raise the boom and hold the load, use the signal shown in Figure 1-54.



Raise the Boom and Hold the Load

Figure 1-54. Raise the Boom and Hold the Load Signal

When the boom and load must be swung left or right, point in the direction you wish. If you want the entire crane to move on its treads, hold up one hand and step in the direction of travel. Figure 1-55 shows these two motions.

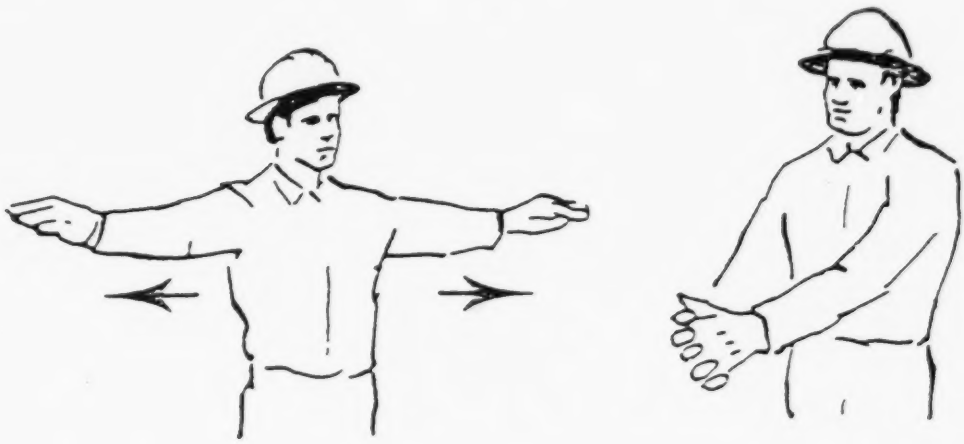


Swing load in direction of finger

Travel in direction signal man faces

Figure 1-55. Swing Load or Travel Signals

The stop signal tells the crane operator to stop all movement. The "dog everything" means to secure the crane in that position. Figure 1-56 shows these two signals.



Stop

Dog Everything

Figure 1-56. Stop/Dog Everything Signals

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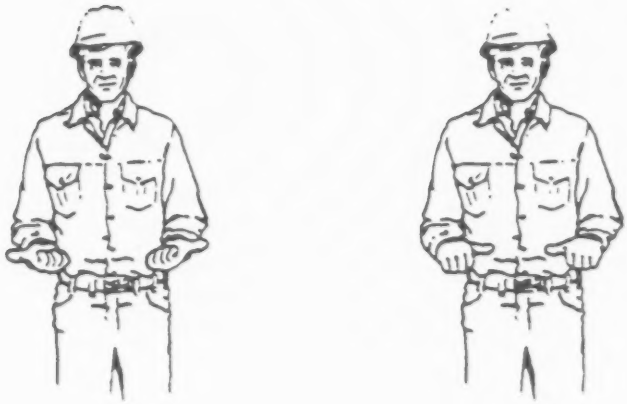
Cranes with telescoping booms require some additional hand signals. Figure 1-57 shows the signals to extend or retract the boom.



Extend Boom

Retract Boom

Figure 1-57. Extend and Retract Boom

When one hand is holding a tag line the same signals must be given using the free hand. Figure 1-58 shows one-handed signals.

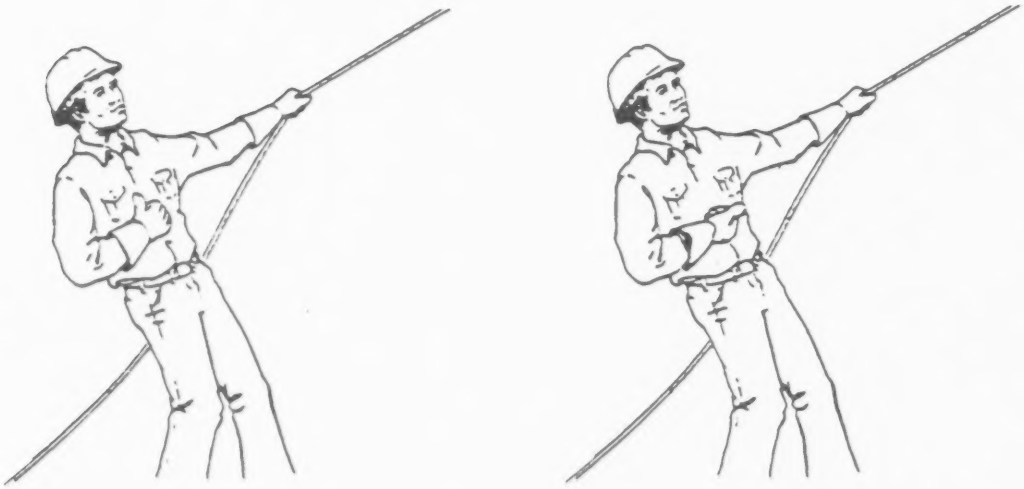


Figure 1-58. Extend and Retract Boom: One-Hand Signals

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

4. This diagram has numerous figures. What are the connections among them?

_____

_____

_____

5. What seems to be the purpose of the diagram?

_____

6. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

7. When might you need the information in the diagrams?

_____

APPLY IT!

1. Sean wants Mike to raise the boom. He _____.

A. points upward with his index finger and moves his hand in a circular motion.

B. sticks his thumb up and moves his hand up and down.

C. extends both arms.

D. clasps his hands in front.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. Mike signals Sean. He clasps his hands in front of him. Sean should _____.

A. retract the boom.

B. raise the boom and hold the load.

C. raise the load slowly.

D. secure the crane.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. Mike point upward and moves his hand in a circular motion. Sean should _____ .

A. raise the load.

B. raise the boom slowly.

C. raise the boom and hold the load.

D. extend the boom.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. Sean is guiding a rope with his left hand. Using his thumb, he points upward with his right hand. Mike should

_____.

A. stop.
B. dog everything.
C. extend the boom.
D. swing the load.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. Mike points left and takes a step to the left. Sean should _____.

A. swing load to the left.

B. move the crane to the left.

C. raise the boom

D. retract the boom

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Choose any three signals. Describe how they're given.

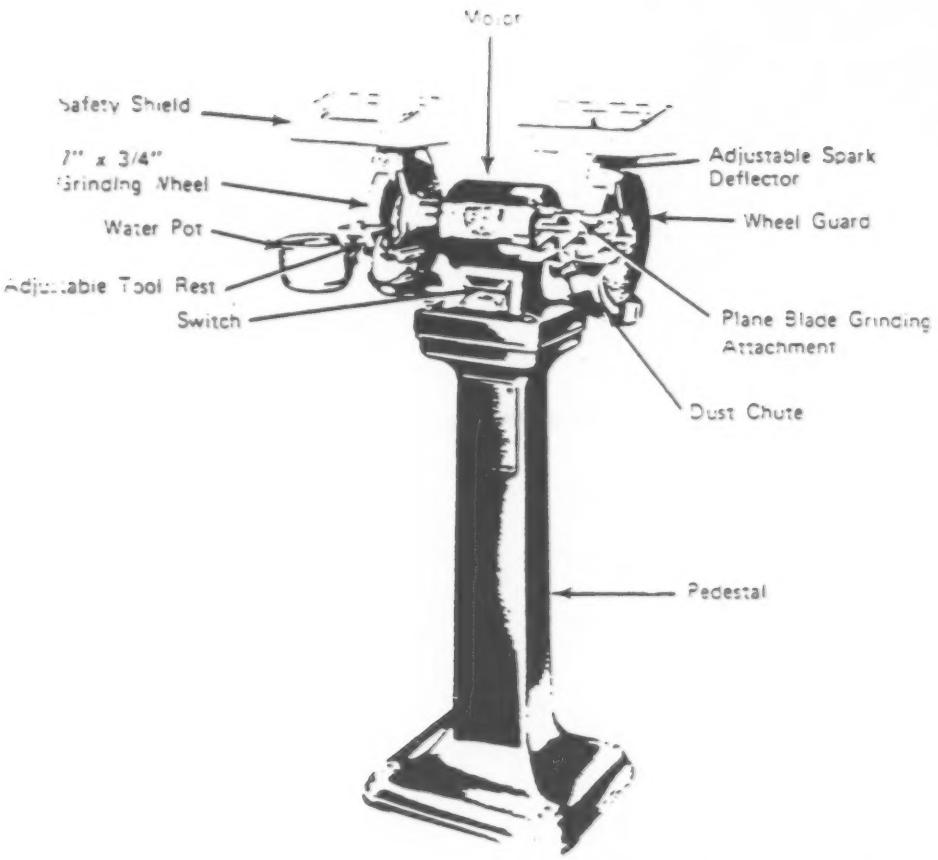
EXAMPLE: Extend Boom: Arms at sides, elbows bent. Forearms parallel to waist. Hands in fists. Thumbs point outward.

EXERCISE 8

Amos showed Kevin how to use a pedestal mounted grinder. Amos gave him a diagram and brief description of the grinder:

GRINDERS

Grinding includes the nonprecision offhand process done on pedestal- or bench-mounted grinders, and precision grinding done on various types of surfaces or cylindrical grinders. Figure 4-8 shows a pedestal-mounted grinder and parts.



Used with Permission of Rockwell International (Power Tool Div.)

Figure 4-8. Pedestal-Mounted Grinder

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

4. What seems to be the purpose of the diagram?

_____

5. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

6. Where might you find the item shown in the diagram?

_____

APPLY IT!

1. Kevin is concerned about safety. What can Amos say about the grinder's safety features to reassure him?

A. water pot

B. adjustable spark deflector

C. dust chute

D. adjustable tool rest

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. What protects the grinding wheel?

A. motor

B. adjustable spark deflector

C. wheel guard

D. safety shield

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. What size grinding wheel does this grinder use?

A. 7" x 3/4"

B. 8" x 1/2"

C. 6" x 1"

D. 7" x 5/8"

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Little explanation accompanies this diagram. Choose any 5 labels from the diagram and define their use.

EXAMPLE: The motor provides power for operating the grinder.

EXERCISE 9

Asa's company purchased a new drill press. Asa reads the following information so he will know how to use it safely.

DRILL PRESSES

The drill press is used mainly for drilling holes, but has many other uses in the carpenter shop. The drill press can be used with a router bit or shaper heads for cutting. Figure 4-10 shows a drill press and parts.

The drill press has two tables. The upper table can be adjusted up or down. It also can be tilted or rotated left or right so the bottom table can be used. The lower table is the based and cannot be adjusted.

The pilot wheel is rotated to move the quill and chuck up and down. The quill has a spring to return it to position.

The speed of the drill press can usually be adjusted. The drill press shown in Figure 4-10 has a variable speed wheel that can select the desired speed. In other types of presses, the belt must be moved to the correct pulley size to get the correct speed.

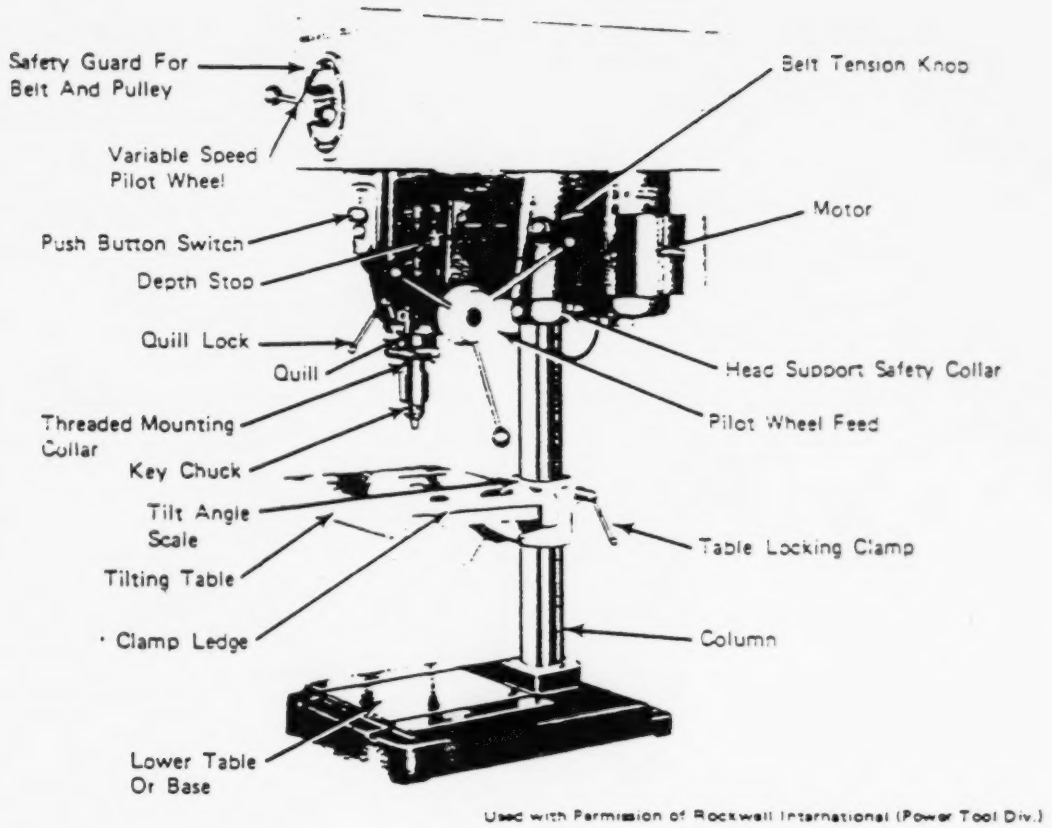


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Figure 4-10. Drill Press

BEST COPY AVAILABLE

TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. What labels are given?

_____

4. What seems to be the purpose of the diagram?

_____

5. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

6. Where might you find the item shown in the diagram?

_____

APPLY IT!

1. Where is the switch for operating the drill press?

A. on the base

B. on the front

C. on the column

D. by the motor

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. According to the written information, what will move the quill and chuck?

A. belt tension knob

B. key chuck

C. pilot wheel

D. head support safety collar

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. Find two parts of the press which might protect Asa when he uses the press. _____

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. Asa plans to cut some pipe with the drill press. What other parts will he need to do this?

A. router heads
B. shaper bits
C. grinder wheels
D. all of the above
E. A and B only

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. Which table is adjustable? What part hold that table in place?

_____

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Little explanation accompanies this diagram. Choose any 5 labels from the diagram and define their use.

EXAMPLE: The motor provides power for operating the grinder.

EXERCISE 10

Jason uses a pedestal grinder for many purposes. He needs to choose a grinding wheel. He refers to the following:

GRINDING WHEELS

Grinding machines use a grinding wheel to remove metal. The grinding wheel consists of abrasive grains held together with a bonding material. Five factors to consider when selecting a grinding wheel for a particular operation are:

ABRASIVE TYPE--manufactured abrasives include two groups, aluminum oxide (A) and silicon carbide (C). A prefix number may be used to identify a particular type of aluminum oxide or silicon carbide. Diamond wheels are available but their expense prevents general use.

GRAIN SIZE--indicated by a number ranging from 10 (coarse) to 600 (five).

GRADE--the measure of the strength of the bonding material holding the abrasive grains. It indicates the relative hardness of a wheel and refers to the bonding agent, not the abrasive. Grade is indicated with a letter from A to Z, with A as maximum softness and Z as maximum hardness.

STRUCTURE--the grain spacing, or the distribution of the abrasive grains throughout the wheel. It is indicated by numbers from 1-12, with the higher numbers being more open.

BOND--the material used to hold the abrasive grains together. Five types are used:

--Vitrified (V) are selected clays mixed with the abrasives, fired until the clay fuses to the abrasive grains.

--Silicate (S) or semi-vitrified bond wheels are softer than the vitrified wheels. They are used to sharpen edge tools.

--Rubber (r) wheels are elastic, very strong, and shock resistant. This bond is used for very thing wheels such as wheels for an abrasive cutoff machine.

--Shellac (E) wheels are also elastic, resilient, and cool cutting. They produce a very fine finish.

--Resinoid (B) wheels have high strength and mechanical shock resistance. This bond is used for large, heavy-duty, high-speed wheels. They are used for rough grinding.

These five factors are recorded on every grinding wheel in a standard marking system. Figure 4-9 shows the standard marking system used by all grinding wheel manufacturers.

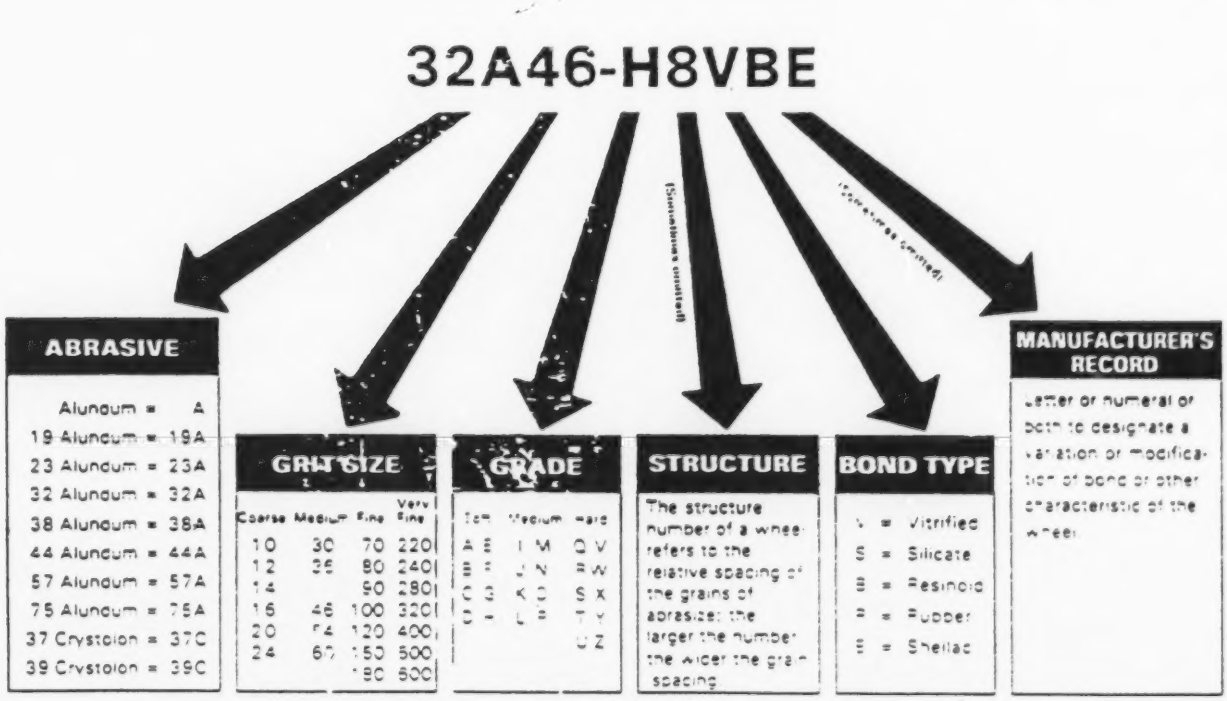
32A46-H8VBE
ABRASIVE
Aluminum = A
19 Aluminum = 19A
23 Aluminum = 23A
32 Aluminum = 32A
38 Aluminum = 38A
44 Aluminum = 44A
57 Aluminum = 57A
75 Aluminum = 75A
37 Crystolon = 37C
39 Crystolon = 39C
GRIT SIZE
Coarse Medium Fine Very Fine
10 30 70 220
12 36 80 240
14 90 280
16 46 100 320
20 54 120 400
24 60 150 500
180 500
GRADE
Soft Medium Hard
A E I M Q V
B F J N R W
C G K O S X
D L P T Y
U Z
STRUCTURE
The structure number of a wheel refers to the relative spacing of the grains of abrasive: the larger the number the wider the grain spacing
BOND TYPE
V = Vitrified
S = Silicate
B = Resinoid
R = Rubber
E = Shellac
MANUFACTURER'S RECORD
Letter or numeral or both to designate a variation or modification of bond or other characteristic of the wheel

Figure 4-9. Standard Marking System for Grinding Wheels

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TRY IT!

1. Where is the title of the diagram?

_____

2. What is the title of the diagram?

_____

3. How is this diagram different from most other diagrams?

_____

4. How will that affect the way you use it?

_____

_____

_____

5. What seems to be the purpose of the diagram?

_____

6. Does text accompany the diagram? _____ What is the relationship between the text and the diagram?

_____

_____

7. Where might you find the number shown in the diagram?

_____

APPLY IT!

1. Jason uses the following grinding wheel: 37C150-R6S

   What is the grade? _____

   What type of abrasive is used? _____

   What is the grit size? _____

   What is the bond type? _____

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

2. Jason wants a grinding wheel with a very fine grit size. It should also have a soft grade. Which one should he use?

A. 38A70-P8S

B. 57A220-I8R

C. 39C180-H9E

D. 19A600-H8B

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

3. Jason has a grinding wheel marked 44A60-R8VBE. What is true about this grinding wheel?

A. It has a coarse grit size.

B. It consists of vitrified silicate.

C. It has a medium grade

D. It uses aluminum oxide as an abrasive.

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

4. What might be left out of a grinding wheel mark?

A. bond type

B. grit size

C. structure

D. abrasive type

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

5. Jason must do some rough grinding. He wants to use a resinoid wheel. Which one would be best?

A. 19A10-Q9RE

B. 24C30-N7BE

C. 75A120-F6VE

D. 38A400-S3EE

(a) Is the answer to this question found on the diagram?

_____

(b) How did you know?

_____

_____

(c) How did you find the answer?

_____

_____

GO WITH IT!

Write a sentence explaining each of the following markings (NOTE: Structure and manufacturer's record are omitted):

EXAMPLE: 57A120-BE: This grinding wheel has 57 Alundum abrasive, fine grit size, a soft grade, and shellac bond.

39C400-TB

23A10-AV

75A60-NR

44A600-SS